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serve any trace of organic structure. * As these trees, of course, have been petrified where they are found now, it would appear as if different mineral substances, held in solution in the water, had acted upon the woody tissue in different ways, according to its nature. In any case, it is evident that the petrification has been performed in various ways, by the slow action of the liquids penetrating the sand, and not by the uniform crystallization of silica as it is now produced in the hot springs of volcanic origin. This is more evident, in considering silicified wood of our more recent formations. Neither in the plains of Kansas and Nebraska, nor in Eastern Arkansas, nor in Mississippi and Ohio, where fossilized wood is found generally associated with a ferruginous argillaceous sandstone, is there any trace of volcanic agency. There is merely an evident relation of this kind of fossilization with the deposition of iron. In Ohio and Virginia, that part of the Mahoning sandstone containing silicified trunks, borders, and perhaps overlays in part, the area where the richest and most numerous beds of iron ore have been deposited. In the recent formations, the fossilized wood is generally associated with the red or ferruginous clay. Even in the small area occupied by our Post Tertiary formation at Barlow, Ohio, disks of silicified fossil wood of dicotyledonous species are found in a bed of red ferruginous clay, associated with species of shells of the genus *Anodonta*, entirely transformed into a compact mass of oxyd of iron.

SYSTEMATIC ZOOLOGY AND NOMENCLATURE.

BY ALEXANDER AGASSIZ.

THE first requisite for the accurate discussion of any subject is an appropriate nomenclature. The great influence Linnæus exerted upon the progress of Zoology is due to the universal acceptance of the binomial system as a most concise and convenient method, a tool admirably adapted to bring order into the chaos of names of

* It is marked by inflated articulations, like a species of *Anarthrocanna*, Gopp., and is as yet the only specimen found in our Coal Measures which might be compared to the trunks seen by Prof. Brongniart in the coal mines of St. Etienne, France, and compared to Bamboos, from their inflated articulations. (Lyell. *Manuel*, 4th ed., p. 319.)

innumerable animals and plants previously known in each country simply by their vernacular names. In the hands of Linnæus it was the expression of vast erudition, the statement of the affinities of animals and plants, the formula for the classification of the organic world as he understood it. In the hands of his followers and disciples it has become too often the end instead of the means; and, in the last years, the laws requisite for the establishment of the correct name of an animal, or of a plant, have become often as difficult to establish as the most intricate legal question. The greater part of recent systematic works are, of necessity?, filled with pages of synonymy, for the most part taken at second hand, which have been handed down for years with all the errors of quotations. It certainly is an absolute necessity that the units with which zoologists work should be well defined. But has synonymy, as now understood, the value which has been given to it? The history of the present confused condition of nomenclature is an interesting one; it is the attempt to show by the binomial system, not only the correct name of any animal, but, at the same time, give a short historical sketch of the changes the name has undergone. The name of an animal or plant, is that binomial combination which it has first received, let us say *A b* from Linnæus; [*A* (generic) *b* (specific)]. Subsequent changes, such as the transfer of this to a different genus, *B* by Cuvier, are simple matters of registration, a part of the *history of the science*, showing what Cuvier thought of the affinities of the species named *A b* by Linnæus. When then we speak of this species as *B b* Cuvier, we are recording his views as an investigator, and this does not lessen whatever credit there may be in the original description of *A b* by Linnæus. If afterwards Blainville comes and says that Cuvier should have referred *A b* to the genus *C* of Latreille and quotes this species hereafter as *C b* Blainville, he is only recording his opinion and so on through indefinite time. Changes which the progress of science render necessary in the position of *A b* of Linnæus are, or should be quoted under the authority of the author who proposes them as expressing the actual condition of our knowledge of the affinities of the species *A b* of Linnæus. Unfortunately the writing of the authority after such a change is often considered as an honor by naturalists, and much valuable time is lost in ransacking old books to find out incorrect combinations, which are subsequently corrected with great flourish of trumpets,

as if this process advanced our knowledge of the affinities of the animals under discussion. No naturalist ignores wilfully what others have already done before him ; it is generally from absolute impossibility to obtain the desired information, and if the question of nomenclature were generally regarded simply as a matter of registration ; it would help to rid our systematic treatises of a mass of useless lumber. *

But systematic Zoology used as it should be, as the connecting link between all the branches of sciences forming the great whole of Zoology has a totally different meaning. It becomes an epitome of years of study, the concise expression of the thoughts of the writer on the affinities of the animals he is discussing. Systematic zoologists have until lately laid claim to be recognized exclusively as zoologists, we should remember, now at least, that Physiology, Comparative Anatomy, Morphology, Embryology, Palæontology, Histology, Psychology and Geographical Distribution are as much a part of Zoology as the mere questions of classification and nomenclature. Great as have been the benefits derived by following the principles of Linnaeus we must nowadays return to old Aristotle and take him for our guide. The Aristotelian view of the whole knowledge of the life of an animal is the true conception of what Zoology should be. The convergence towards this broad base of Zoology, by workers in the different fields mentioned above, shows the necessity of some element in common to express the variable quantities constantly obtained from a closer and more accurate examination of nature. This element systematic Zoology furnishes, it gives us the quantities to make our equations. and when it takes this broad form is no longer a mere dry collection of meaningless names, but becomes our interpretation of nature. The facility with which, in a new country, unknown animals can be described and the notoriety thus readily obtained, is a strong incentive to go on with descriptive work, not that I would, as is frequently done, deny all value to systematic Zoology, but it

*The rules of nomenclature generally adopted are by no means satisfactory. The exceptions constantly taken to their application only increase the confusion, and the attempts made by the British Association to recommend a set of rules for the guidance of Naturalists have not been successful. The recent revision of these rules shows how impossible it is to lay down general instructions intended to be retrospective and prospective; to apply them to times of which the scientific spirit was so totally different from our own. All that we can with any justice demand is that the original name by which a species was first baptized, should be recognized to the exclusion of all others. if it is possible to determine this name with accuracy.

should not be forgotten that the true purpose of systematic work must be to increase our knowledge of the relationship of animals of any special group already known, and serve in some way as a connecting link in the chain of the various branches of Zoology. We have our memoirs of systematic Zoology, of Psychology, of Palæontology, of Comparative Anatomy, of Histology, etc., treating of their respective sciences as isolated departments and strongly biassed by the characteristics of the sciences from which they originated. Comparative Anatomy, and Physiology as well as Histology, are the children of Human Anatomy, and this, in its turn, was gradually developed from the needs of medicine. Embryology and Palæontology, though so intimately connected, are rarely treated together, the latter being considered to belong, by birthright, to Geology. Psychology is but now becoming emancipated from speculative Philosophy. We have, however, no recent memoir on Zoology in the Aristotelian sense; the sciences forming the branches of Aristotelian Zoology stand upon separate pedestals. They have grown up independently of one another, yet they all converge towards a common point, each an important part in the life history of every animal, and the common link which is to unite them all is (when rightly understood) systematic Zoology.

Working in this spirit, systematic Zoology helps us in our attempts to understand the laws of nature; these must remain unintelligible to him who is busy with naming and classifying materials, reducing his science to an art, merely accumulating facts to be stored in museums, forming as it were a library of nature. To him its books will be inaccessible and its laws as inexplicable as are the laws of the motions of the planets to one who has no knowledge of the existence of gravitation.

WHAT I FOUND AT HAMPTON BEACH.

BY PROF. J. W. CHICKERING, JR.

ABOUT fifty miles northeast from Boston, on the coast of New Hampshire, juts out into the ocean the bold headland known as Boar's Head, perhaps half a mile long, a quarter of a mile wide,